

A PRELIMINARY STUDY OF THE SUBGENUS
LEPTOCHILUS IN NORTH AMERICA

(Hymenoptera, Vespidae)

BY RICHARD M. BOHART

University of California, Los Angeles

The small and commonly red marked *Odynerus* of the subgenus *Leptochilus* are abundantly represented in North America, where the majority of the species are found in the arid regions of the southwest. However, they are scarce in collections because of their small size and unobtrusive habits. In a previous paper¹ I outlined the characters of the subgenus and redescribed an eastern species, *republicanus* D. T. The North American *Leptochilus* can be divided into about a dozen well defined species groups on the basis of structural characters. The present paper includes five of these groups and the others will be treated at a later date.

Much of the material used in the preparation of this paper was obtained through the cooperation of the U. S. National Museum, Museum of Comparative Zoology at Harvard, California Academy of Sciences, Academy of Natural Sciences at Philadelphia, University of Kansas, Washington State College, Oregon State Agricultural College, Colorado State College, and Pomona College. Individuals who were of greatest assistance through loan or donation of specimens were J. Bequaert, P. H. Timberlake, G. E. Bohart, E. G. Linsley, and C. D. Michener.

My attention has been called by Jos. Bequaert to the correct dates of *Leptochilus* and *Parodynerus* which I previously cited as 1852 and 1856.

Genus ODYNERUS Latreille, subgenus LEPTOCHILUS Saussure.

Leptochilus Saussure, 1853. Etud. Fam. Vesp., 1:233.

Parodynerus Saussure, 1855. Etud. Fam. Vesp., 3:245.

Microdynerus Thomson, 1874. Scandinaviens Hymenoptera, 3:58.

Zendalia Robertson, 1928. Flowers and Insects, p. 12.

KEY TO THE RUFINODUS GROUP

1. Pronotal angles projecting strongly outward and forward; first abdominal tergite almost invariably red marked; female clypeus

¹Bohart, R. M., Notes on *Odynerus* with a key to the North American subgenera and description of a new subgenus. Pan-Pac. Ent., 15:97-104, July, 1939.

- and mandibles of both sexes usually for the most part black; distance between apical teeth of male clypeus as great as length of third antennal segment (Pacific Slope).....*rufobasilaris*
- . Pronotal angles not strongly projecting forward and outward; distance between apical teeth of male clypeus less than length of third antennal segment.....2
2. First tergite light red except at apex (first tergite very rarely black), pale markings whitish, mandibles usually reddish, first two tergites of female and first three of male usually apically banded (western U. S.).....*rufinodus*
- . First tergite black and yellow, or marked with dark reddish; pale markings often tending toward orange.....3
3. Black and pale yellow; first five abdominal tergites (at least) apically banded (Arizona).....*trachysomus*
- . Markings tending toward orange; first and second tergites (at most) apically banded.....*republicanus*

This group may be distinguished by the following sum of characters: The postscutellum has a distinct sharp transverse crest, the female mandible is four toothed, the inter-ocellar area has two oblique swellings, and the second sternite is more than twice as broad as long but lacks a basal median suture.

The four North American species may also be separated on the basis of the male genitalia as figured.

ODYNERUS RUFINODUS Cresson

Odynerus rufinodus Cresson, 1868. Tr. Amer. Ent. Soc., 1:181 (holotype, female, A.N.S.P.).

I have seen specimens from Texas, New Mexico, Kansas, Colorado, Utah, Wyoming, Arizona, and California. A rare form with black instead of red on the first tergite is known to occur with the red forms in Texas, Wyoming, and California. The subapical hooks of the male ædeagus project sharply backward in contrast to those of *rufobasilaris*. The parameres are similar to those figured for *republicanus*.

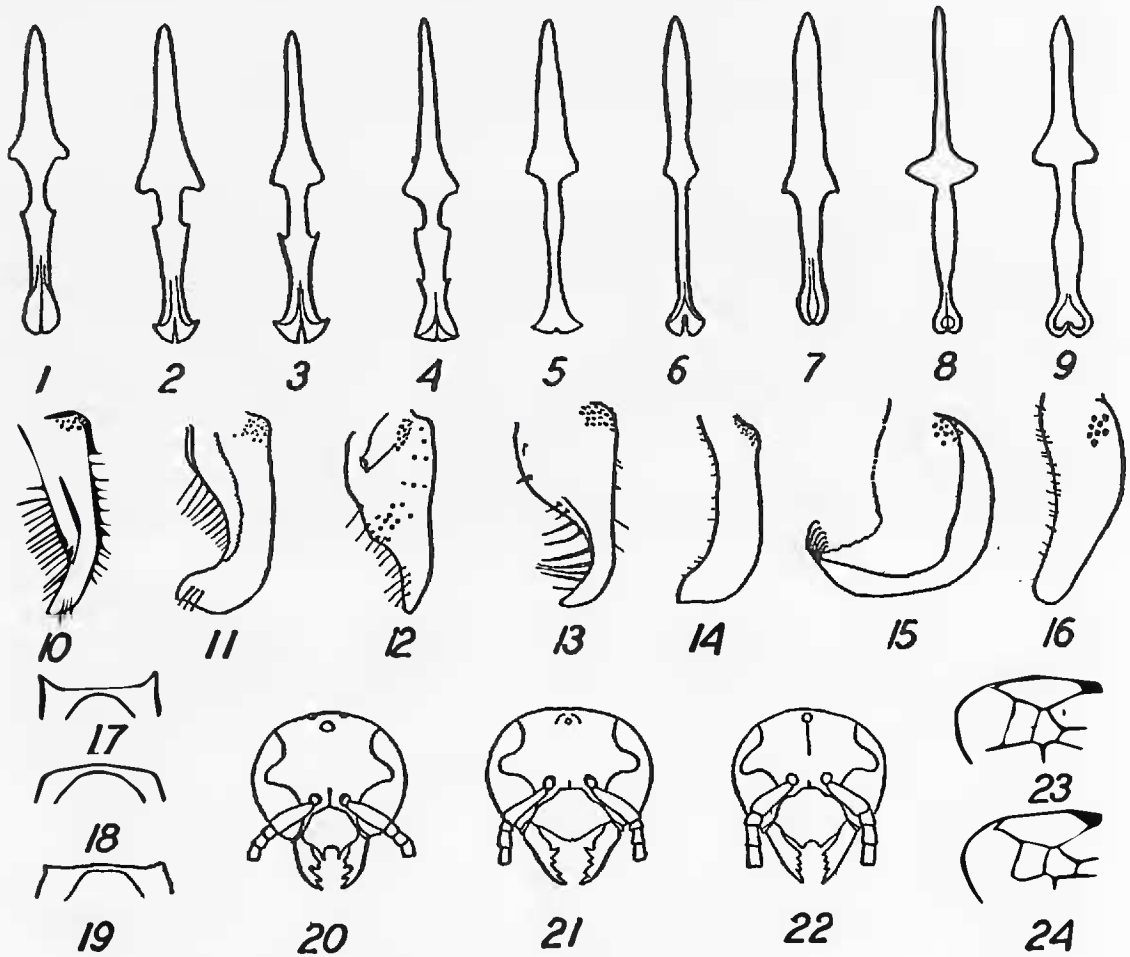
ODYNERUS RUFOBASILARIS Ashmead

Odynerus rufobasilaris Ashmead, 1896. Psyche, 7:335 (types, U.S.N.M.).

Odynerus bruesi Cameron, 1909. Pom. Jour. Ent., 1:81.

This species is widespread in California where I have seen specimens from Siskiyou, Shasta, Trinity, Tahoe, Tuolumne, Mariposa, Sonoma, Kern, Los Angeles, Riverside, and San Bernardino counties. I also have a record from Grand Coulee, Co-

lumbia River, Washington, July 12, 1902. Northern specimens sometimes have the first tergite black instead of reddish. The projecting pronotal angles are diagnostic. The male parameres are similar to those figured for *republicanus*.



North American species of *Odynerus*, subgenus *Leptochilus*. Top row, dorsal view of aedeagus of: 1, *republicanus*; 2, *rufobasilaris*; 3, *rufinodus*; 4, *trachysomus*; 5, *erubescens*; 6, *rubicundulus*; 7, *lissosomus*; 8, *tylocephalus*; 9, *minutissimus*. Middle row, dorsal view of right paramere of: 10, *republicanus*; 11, *trachysomus*; 12, *erubescens*; 13, *rubicundulus*; 14, *lissosomus*; 15, *tylocephalus*; 16, *minutissimus*. Bottom row, left, front margin of female prothorax from above of: 17, *rufobasilaris*; 18, *erubescens*; 19, *rubicundulus*; center, front view of male head and basal antennal segments of: 20, *lissosomus*; 21, *trachysomus*; 22, *minutissimus*; right, apical portion of female anterior wing of: 23, *erubescens*; and 24, *monotylus*.

ODYNERUS REPUBLICANUS Dalla Torre

Leptochilus ornatus Saussure, 1853. Etud. Fam. Vesp., 1:233 (nec Smith).

Odynerus republicanus Dalla Torre, 1889. Wien. Ent. Zeit., 8:125.

Odynerus zendaloides Robertson, 1901. Tr. Amer. Ent. Soc., 27:202.

I have seen specimens from South Carolina, Virginia, New Jersey, New York, Massachusetts, Ohio, Missouri, Texas, Kansas, Colorado, and Nebraska. Southern specimens usually have the first abdominal tergite marked with red. Northern specimens have this tergite either very dark red or black. It is the latter variety that Robertson named *zendaloides*.

Odynerus trachysomus Bohart, new species.

Male. Black; clypeus, first antennal segment in front, anterior margin of pronotum except at middle, tegula except central spot, mesopleural spot, two spots on scutellum, front femur and all tibiae partly, apical margins of first six tergites and second sternite, ivory yellow; mandible apically, tarsi, wing veins and clouded area along front wing margin, brownish. Pubescence of clypeus very short, sparse, and silvery; that of rest of body obscure, dull silvery. Puncturation coarse and moderately dense, punctures of head and thorax mostly less than a puncture diameter apart, front face of pronotum sparsely punctured, first two tergites with smooth apical margins bordered inwardly by a zone of very large punctures. Head cubicle; mandible four-toothed, the basal tooth large and sharp; antennal hook somewhat flattened, reaching to apex of tenth segment; clypeus strongly convex, minutely incised apically; oblique inter-ocellar tubercles prominent. Pronotal angles about 90 degrees, projecting slightly forward and outward; postscutellum sharply carinate, propodeum untoothed above. First two tergites raised apically; second tergite twice as broad as long and with a broad basal concavity; aedeagus abruptly inflated apically and with a sharp pair of subapical hooks visible in dorsal view. Length to apex of second tergite, 9 mm.

Female. Markings, pubescence, and puncturation about as in male with exceptions as follows: Clypeus yellow at base only, first five tergites apically banded. Mandibles stout, short, and four-toothed; clypeus minutely incised apically; third antennal segment one and one-half as long as second; second sternite two and one-half times broader than its median length; length to apex of second tergite, 9 mm.

Holotype, male, Santa Rita Mts., Ariz., July 17, 1932 (R. H. Beamer); allotype, female, Santa Rita Mts., Ariz., June (F. H. Snow). Paratypes, three females, Baboquivari Mts., Ariz., Aug., 1924 (O. C. Poling). Holotype and allotype to be returned to the University of Kansas, paratypes in collections of the California Academy of Sciences and the author.

Readily recognizable by its more extensive and ivory colored markings. From *republicanus*, its nearest ally, *trachysomus* also differs in the structure of the male genitalia.

TYLOCEPHALUS GROUP

The two North American species comprising this group are distinguished by having a single swelling on the vertex between the posterior ocelli. Also, the second sternite has the median basal suture faint or absent, there is a small sharp tubercle between and above the antennal bases, the propodeum is untoothed, the postscutellum is sharply crested, the female mandible is four-toothed, and the middle femur of the male is depressed beneath toward the base. The group is represented in Central and South America by several species among which is *acolhuus* Saussure.

Odynerus tylocephalus Bohart, new species

Black; top of mandible, first two antennal segments, prothorax, tegula, mesopleural spot, scutellum and postscutellum, propodeum mostly, legs, first abdominal segment, apical border of second segment, reddish yellow to reddish; wings dark smoky, hind wing apically spotted. Pubescence pale and short except for a single apical row of long hairs on sternites three to six in male and three to five in female. Body closely and coarsely punctured, less so on abdomen. Third antennal segment shorter than fourth; hook of male antenna small, flattened, reaching about half the length of eleventh segment; mandible four-toothed in both sexes; clypeus of male about as long as broad, angularly incised between apical teeth; clypeus of female broader than long; tubercle of vertex dulled by minute punctures; pronotal angles sharp and slightly obtuse as seen from above; middle femur of male contorted, depressed beneath before the middle; third submarginal cell of fore wing almost as broad as high; first abdominal tergite raised apically; aedeagus as figured; parameres with a row of bristles apically and rows of thick short setae along inner side basally; length to apex of second tergite, male 6 mm., female 6.5 mm.

Holotype, male, and allotype, female, Palm Beach, Florida (C. F. Baker collection). Seventeen paratypes from the following localities in Florida: Palm Beach, Sanford, Coconut Grove, Fort Mead, Upper Matecumbe Key, Lower Matecumbe Key, Brantown, Miami, Key Biscayne, Cape Sable road, Key Largo, and Paradise Key; one paratype from Jekyll Island, Georgia. Holotype and allotype to be returned to the U. S. National Museum, paratypes in the collections of the California Academy of Sciences, Museum of Comparative Zoology at Harvard, University of Kansas, Washington State College, J. Bequaert, and the author.

In general appearance *tylocephalus* resembles two other species from Florida which belong, however, to the subgenus *Stenodynerus*. These are *histrion* Lepelletier and *anacardivora* Rohwer. The tubercle of the vertex and the lack of pronotal pits easily differentiate *tylocephalus*.

Odynerus monotyplus Bohart, new species

Male. Black; clypeus, first antennal segment in front, front margin of prothorax, mesopleural spot, band across scutellum, tibiae and tarsi partly, apical margins of first tergite and second segment of abdomen, yellow; tegula reddish; wings dark stained, slightly violaceous, hind wing spotted apically, pubescence pale and short except for rows of long hairs on apices of third to sixth sternites. Puncturation coarse and close, becoming finer on abdomen. Third antennal segment shorter than fourth; antennal hook small, flattened, reaching about half the length of eleventh segment which is concave beneath; clypeus almost as long as broad, roundly incised between apical teeth; tubercle of vertex dulled with minute punctures; pronotal angles sharp and slightly obtuse as seen from above; middle femur contorted, depressed beneath before the middle; third submarginal cell of fore wing almost as broad as high; first abdominal tergite raised apically; aedeagus and parameres about as figured for *tylocephalus*, parameres with a row of bristles apically and rows of thick short setae along inner side basally; length to apex of second tergite, 6.5 mm.

Female. General characters about as in male except as follows: Clypeus black, markings of head and thorax tending toward red, apex of third tergite yellow-banded. Length to apex of second tergite, 6.5 mm.

Holotype, male, Chatsworth, New Jersey, July 6, 1935; allotype, female, South Hill, Virginia, June 2, 1917. Eighteen paratypes from the following localities: Stony Brook reservation, Massachusetts; Fort Lee and Alpine, New Jersey; Long Island and Millwood, New York; South Hill, Virginia; Black Mt., North Carolina; Greenville, South Carolina; Atlanta, Georgia; Mobile, Alabama; Fedor, Mineola, Cameron Co., New Braunfels, and McDade, Texas; Tempe, Arizona; mountains near Claremont, California. Holotype and allotype to be deposited in the California Academy of Sciences, paratypes in the collection of U. S. National Museum, Museum of Comparative Zoology at Harvard, University of Kansas, Pomona College, J. Bequaert, and the author.

The entirely different markings of *monotylus* should differentiate it from *tylocephalus*. Structurally the two appear to be practically identical. Some specimens of *monotylus* have more of the abdominal segments banded. Also, the hind margin of the prothorax may be partially yellow-bordered.

MINUTISSIMUS GROUP

So far this group is known only from a single species which contains the smallest specimens of *Odynerus* that I have seen. It is structurally similar to the *tylocephalus* group but lacks the tubercle of the vertex, the sharp tubercle between the antennal bases, and the depressed middle femur of the male, as well as possessing a different type of male genitalia.

Odynerus minutissimus Bohart, new species

Black; clypeus in male and basal spot of clypeus in female, apex of male antenna beneath, prothorax in front, tegula, mesopleural spot, band across scutellum, legs partly, apical bands on first tergite and second segment of abdomen, pale yellow; wings smoky and slightly violaceous, apical cell dark. Pubescence short, sparse, and silvery; apical abdominal segments fringed with moderately long hairs. Puncturation moderate, punctures mostly about one puncture diameter apart, apices of first two tergites smooth. Third and fourth antennal segments subequal; male antennal hook reaching base of eleventh segment; clypeus almost as long as broad, shallowly excavated apically; pronotal angles moderate, obtuse; first tergite, and second sparingly, raised apically; second sternite more than twice as long as broad; genitalia as figured; length to apex of second tergite, male 4 mm., female 5 mm.

Holotype, male, Indio, Riverside Co., Calif., Apr. 7, 1936, at mesquite flowers (P. H. Timberlake); allotype, female, Palm Springs, Riverside Co., Calif., Apr. 15, 1938 (G. E. and R. M. Bohart). Eighteen paratypes from the following localities in California: The Narrows, San Diego Co.; Whitewater, Andreas Canyon, Palm Springs, Indio, Mecca, Dos Palms, and Shavers Well, Riverside Co.; Furnace Creek (Death Valley), Inyo Co. One female paratype, Glendale, Nevada, June 15, 1930, on *Covillea tridentata* (E. W. Davis). A single specimen in my collection bears the data, Arizona (C. F. Baker). Holotype and allotype to be deposited in the California Academy of Sciences, paratypes in the collections of U. S. National Museum, J. Bequaert, P. H. Timberlake, E. G. Linsley, and the author.

LISSOSOMUS GROUP

The structural characters given for *minutissimus* for the most part apply here also. However, this group has the second tergite broader than long and the puncturation of the body exceedingly fine. In addition to the single species of the group in North America, I have seen two European species, *timidus* Saussure and *nugdunensis* Saussure, which definitely belong to it. The former can hardly be separated specifically from *lissosomus* but is somewhat more heavily punctured.

Odynerus lissosomus Bohart, new species

Male. Black; mandible except for reddish apex, flagellum beneath, prothorax in front, tegula, mesopleural spot, spots on scutellum, legs partly, apical bands on abdominal tergites and second and third sternites, pale whitish yellow; flagellum above, apex of mandible, scutellum mostly, postscutellum, propodeum except superior face, legs partly, first two abdominal segments mostly, other segments partly, reddish; wings slightly smoky. Pubescence short, sparse, and silvery. Body minutely punctured, appearing smooth except under high magnification. Clypeus very deeply and roundly incised apically; mandible deeply notched between second and third teeth, antennal hook minute, reaching half the length of eleventh segment; pronotal angles moderate, obtuse; first abdominal tergite somewhat raised apically; ædeagus short, with a thick neck, cleft apically; parameres paddle-shaped and almost hairless, ending far below apex of ædeagus; length to apex of second tergite, 5 mm.

Female. Markings, pubescence, and puncturation about as in male with the following exceptions: Clypeus black except at base; mandible, antenna beneath, prothorax mostly, mesopleuron partly, reddish; third and following abdominal segments dark brown. Mandibular teeth regular, clypeus with a small apical incision; length to apex of second tergite, 5.5 mm.

Holotype, male, Palm Springs, Riverside Co., Calif., Apr. 24, 1938 (P. H. Timberlake); allotype, female, Riverside, Riverside Co., Calif., Apr. 11, 1934, on *Eriogonum fasciculatum* (P. H. Timberlake). Paratypes, one male and six females, Claremont, Los Angeles Co., Calif. (C. F. Baker); one female, Palm Springs, Riverside, Co., Calif., Apr. 16, 1939 (R. M. Bohart); one male, Mt. Diablo, Contra Costa Co., Calif., Apr. 24, 1937 (G. E. and R. M. Bohart). Holotype and allotype to be deposited in the California Academy of Sciences, paratypes in the collections of Pomona College, P. H. Timberlake, and the author.

ERUBESCENS GROUP

This group may be recognized by the following combination of characters. The second sternite may or may not have a crease-like basal median suture, the postscutellum is sharply crested, no inter-ocellar or vertex tubercles are present, the horizontal portion of the first tergite is sparsely punctured and shining, the second abdominal sternite is broader than long, the female mandible is four-toothed, and the middle femur of the male is normal. Only two species of the group are known at present.

Odynerus erubescens Bohart, new species

Male. Black; clypeus, first antennal segment in front, front margin of prothorax, tegula mostly, legs partly, apices of first tergite and second to sixth abdominal segments, whitish yellow; antenna apically, propodeum, legs partly, first abdominal segment mostly, red; wings brown stained, especially in apical cell. Pubescence short and silvery. Puncturation of head and thorax moderate, punctures separated by about one puncture diameter; clypeus hardly punctured; puncturation of abdomen fine, heaviest toward apex of second tergite. Clypeus much broader than long, roundly incised between the tiny apical teeth, width of emargination less than length of fifth antennal segment; mandible evenly four-toothed; antennal hook slender, sharply pointed, and reaching to base of eleventh segment, second to fourth segments subequal in length; pronotal angles rounded slightly, not projecting forward; middle femur normal; propodeum with an indistinct tubercle near angles of postscutellum; first abdominal tergite slightly raised and smooth apically; second sternite with a distinct crease-like basal median suture; aedeagus as figured; parameres with slender bristles along their inner curved surfaces; sheath of lateral spine elongate, rounded, and bristleless apically; length to apex of second tergite, 5 mm.

Female. Markings, pubescence and puncturation about as in male with following exceptions: Clypeus and third to sixth abdominal segments black; mandible and postscutellum red; legs red and black. Clypeus narrowly and shallowly incised between apical teeth; length to apex of second tergite, 6 mm.

Holotype, male, Riverside, Riverside Co., Calif., Apr. 15, 1932, on *Lotus scoparius* (P. H. Timberlake); allotype, female, Riverside, Calif., May 21, 1925, on *Eriogonum fasciculatum* (P. H. Timberlake). Forty-five paratypes from the following localities in California: Campo, San Diego Co.; Palm Springs

and Riverside, Riverside Co.; Claremont, Whittier, Pasadena, Altadena, Azusa, La Crescenta, Palmdale, and Lancaster, Los Angeles Co.; Crestline, San Bernardino Co.; Argus Mts., Mazurka Canyon, and Lone Pine creek, Inyo Co.; Tallac Lake, Placer Co. Seven paratype females, Buckeye, Arizona, Mar. 28, 1934, on *Lycium torreyi* (P. H. Timberlake). Other recorded host plants are *Lotus glaber*, *Lotus agrophyllus*, and *Baccharis viminea*. Atypical specimens with black instead of red on the first tergite are in my collection from Buckeye, Arizona; Berkeley, Alameda Co. and Mt. Diablo, Contra Costa Co., California; Klamath Falls, Oregon; Pullman and Wawawai, Washington. Pullman specimens bear the additional data "reared from larvæ in stems of *Sambucus glauca*." Holotype and allotype to be deposited in the California Academy of Sciences, paratypes in collections of U. S. National Museum, Pomona College, J. Bequaert, P. H. Timberlake, E. G. Linsley, C. D. Michener, and the author.

Odynerus rubicundulus Bohart, new species

Male. Black; clypeus except apically, first antennal segment in front, spot on mandible, pronotum in front, mesopleural spot, lateral spot on scutellum, legs partly, whitish yellow; tegula mostly, apical margins of first tergite and second and third abdominal segments, whitish; antenna beneath and legs partly, brownish red; first abdominal segment red except for apical band; wings nearly clear except in apical cell. Pubescence obscure, silvery. Puncturation moderate; sparse on clypeus, propodeum, and first tergite; elsewhere punctures mostly separated by at least a puncture diameter; first and second tergites apically smooth. Clypeus much broader than long, roundly incised between apical teeth, the width of emargination as great as length of fifth antennal segment; mandible evenly four-toothed; antennal hook moderately slender, pointed apically and reaching to base of eleventh segment, second to fourth segments subequal in length; pronotal angles rounded, slightly but distinctly projecting forward as seen from above; middle femur normal; propodeum with an indistinct tubercle near angles of postscutellum; first and second abdominal tergites slightly raised apically; second sternite without a median basal suture; ædeagus as figured; parameres with long stout bristles along their inner edges; sheath of lateral spine elongate, whip-like, and with a single terminal bristle; length to apex of second tergite, 5.5 mm.

Female. Markings, pubescence, and puncturation about as in

male with following exceptions: Mandible red, clypeus black; propodeum mostly red; third abdominal segment without apical band. Clypeus well punctured and with a small apical incision; length to apex of second tergite, 6.5 mm.

Holotype, male, allotype, female, and three paratype females, Lone Pine creek, Inyo Co., Calif., June 6, 1939 (R. M. Bohart); paratypes, two males, Olancho, Inyo Co., Calif., May 20, 1937 (J. W. Johnson and N. W. Frazier); one male and one female, Altadena, Los Angeles Co., Calif. (C. D. Michener); one female, Mariposa, Mariposa Co., Calif., June 13, 1938 (R. M. Bohart). Holotype and allotype in California Academy of Sciences, paratypes in collections of U. S. National Museum, C. D. Michener, and the author.

This species is easily separated from *erubescens*, which it resembles superficially, by the absence of the median basal suture of the second sternite, the forward projecting pronotal angles, the broader emargination of the male clypeus, and differences in the male genitalia.

A CONOPID FLY PARASITE OF MEGACHILE

(Hymenoptera, Apoidea)

While excavating for *Microbembex* cocoons in the sand dunes near Antioch, California, October 16, 1938, a dead male *Megachile* (*Xanthosaurus*) *perihirta* Cockerell¹ was taken from the end of a short burrow in a hard packed sand cliff. No evidence of megachilid cells was present which indicates that the bee was occupying a "resting burrow" (a common habit of male bees) when killed by the pupation of the conopid fly parasite, *Conops argentifacies* Van Duzee² within its abdomen.

The bee was put in a small vial with a cotton plug. The conopid emerged on March 15 but in a very stunted and undeveloped condition.—George E. Bohart and John W. MacSwain, University of California.

¹ *Megachile perihirta* Cockerell, 1898, Ann. Mag. Nat. Hist., (7), 1:126.

² *Conops argentifacies* Van Duzee, 1927, Proc. Cal. Acad. Sci., (4), 16:574-575.